

Docket No.: 12810-00159-US1  
(PATENT)

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Alexandra Brand et al.

Application No.: 10/554,701

Confirmation No.: 9514

Filed: October 27, 2005

Art Unit: 1621

For: CATALYST FOR THE PRODUCTION OF  
METHYL MERCAPTAN FROM METHANOL  
AND HYDROGEN SULFIDE

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Examiner: C. O. Nwaonicha

**APPEAL BRIEF**

MS Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Madam:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on May 21, 2009, and is in furtherance of said Notice of Appeal.

The fees required under § 41.20(b)(2) are dealt with in the accompanying  
TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

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|------|---|
| I.   | Real Party In Interest                        |
| II   | Related Appeals and Interferences             |
| III. | Status of Claims                              |
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I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

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II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 20 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 0
2. Claims withdrawn from consideration but not canceled: 0
3. Claims pending: 1-20
4. Claims allowed: 0
5. Claims rejected: 1-20

C. Claims On Appeal

The claims on appeal are claims 1-20

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

## V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed subject matter is directed to a catalyst for the synthesis of methyl mercaptan and a process for preparing methyl mercaptans. Methyl mercaptan is an important intermediate for the synthesis of, for example, methionine and alkanesulfonic acids. The catalyst in accordance with the claimed subject matter achieves a higher yield and a higher selectivity towards methyl mercaptan. Remarkably, the synthesis of methyl mercaptan with higher yield and higher selectivity is achieved using a lower stoichiometric excess of hydrogen sulfide compared to the prior art. See page 1, lines 6-11, page 2, line 38 to page 3, line 2, and page 7, lines 9-23, of the specification.

According to claim 1, the pH of the catalyst, measured on a 10% strength aqueous solution, is in the range from 5.0 to 9.7. See page 4, lines 5-6.

According to claim 2, the catalyst is obtainable from aluminum oxide, an alkali metal tungstate and at least one ammonium salt. See page 3, lines 4-8.

According to claim 3, the alkali metal tungstate used is a potassium tungstate. See page 3, lines 10-11.

According to claim 4, the ammonium salts used are sulfates, phosphates, sulfides, tungstates, molybdates, sulfites, peroxodisulfates, phosphites and hypophosphites. See page 3, lines 17-19.

According to claim 5, the ammonium salts used are sulfur- or phosphorus-comprising salts or tungstate salts. See page 3, lines 19-20.

According to claim 6, the alkali metal tungstates are applied in an amount of from 10 to 16% by weight, based on the total mass of the catalyst. See page 3, lines 11-13.

According to claim 7, the ammonium salts are applied in an amount of from 0.01 to 15% by weight, based on the total mass of the catalyst. See page 3, lines 21-22.

According to claim 8, the catalyst according to claim 1 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 9, the catalyst according to claim 2 is obtainable from aluminum oxide, an alkali metal tungstate and at least one ammonium salt. See page 3, lines 4-8.

According to claim 10, the alkali metal tungstate used is a potassium tungstate in the catalyst according to claim 2. See page 3, lines 10-11.

According to claim 11, the ammonium salts used in the catalyst according to claim 2 are sulfates, phosphates, sulfides, tungstates, molybdates, sulfites, peroxodisulfates, phosphites and hypophosphites. See page 3, lines 17-19.

According to claim 12, the ammonium salts used in the catalyst according to claim 2 are sulfur- or phosphorus-comprising salts or tungstate salts. See page 3, lines 19-20.

According to claim 13, the alkali metal tungstates are applied in an amount of from 10 to 16% by weight, based on the total mass of the catalyst according to claim 2. See page 3, lines 11-13.

According to claim 14, the ammonium salts are applied in an amount of from 0.01 to 15% by weight, based on the total mass of the catalyst according to claim 2. See page 3, lines 21-22.

According to claim 15, the catalyst according to claim 2 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 16, the catalyst according to claim 3 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 17, the catalyst according to claim 4 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 18, the catalyst according to claim 5 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 19, the catalyst according to claim 6 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

According to claim 20, the catalyst according to claim 7 is used in a process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide. See page 3, lines 17-19.

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Has the Examiner established that claims 1-20 are obvious over the applied citations, namely, U.S. Patent No. 5,852,219 to Sauer et al. in view of the article “Activity of Tungstate Catalysts in the Synthesis of Methyl-Mercaptane [sic] from Methanol and Hydrogen Sulfide,” Reaction Kinetics and Catalysis Letters (1988), 36(1), 159-164, to Mashkina et al., and that the Claims are, therefore, unpatentable under 35 U.S.C. §103(a)?

## VII. ARGUMENT

A. The applied citations to Sauer and Mashkina fail to recognize that the pH of an aqueous suspension of the catalyst is a result-effective variable.

Claims 1-20 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,852,219 to Sauer et al. (hereinafter “Sauer”) in view of “Activity of Tungstate Catalysts in the Synthesis of Methyl-Mercaptane from Methanol and Hydrogen Sulfide,” Reaction Kinetics and Catalysis Letters (1988), 36(1), 159-164, to Mashkina et al. (hereinafter “Mashkina”).

Claim 1 recites, among other features, that the pH of the catalyst, measured on a 10% strength aqueous suspension, is in the range from 5.0 to 9.7. At least this feature of independent claim 1 cannot reasonably be considered to be suggested by Sauer or Mashkina.

Applicants claim a catalyst, i.e., a product, that is more selective, provides for a higher yield, and can be operated closer to the stoichiometrically balanced ratio of 1:1 than the catalyst suggested in Sauer. The superior properties are discussed in more detail below. The December 22, 2008 Office Action, at page 5, first paragraph, however, asserts that varying the pH as a process parameter is not a patentable distinction. This assertion ignores that the claimed catalyst is distinguishable from Sauer as is evidenced by the claimed catalysts' chemical properties, such as the pH of a 10% dispersion.

Moreover, it is unclear to which process conditions the Office Action is referring to. At page 4, lines 1-3, the Office Action refers to page 161 in Mashkina for a suggestion of a "catalyst system" with a pH of 3.3 to 7.0. However, page 161 in Mashkina does not set forth a single pH value let alone the range indicated in the Office Action. Throughout the entire disclosure of Mashkina, a pH range of 3.3 to 7.0 is not explicitly stated. In other parts of Mashkina pH values are suggested, for example, at page 162, lines 22-23, Mashkina suggests the pH values of 0.3 M polytungstate solutions being in the range from 3.8-5.2. However, these pH values relate to the pH of solutions used in the preparation of the catalyst. Specifically, the catalyst supports were impregnated with these polytungstate solutions, subsequently dried at 110 °C, and calcinated at 390 °C for 5 hours. See page 160, lines 2-5, of Mashkina. It is duly noted that the pH of a suspension of the final product cannot be equated with the pH of a solution used in preparing the catalyst prior to impregnating, drying, and calcinating. For example, the aluminum oxide used as a catalyst support in Mashkina contributes to the pH of the suspension, yet the pH of the solution of the polytungstate used to impregnate the support does not reflect the contribution of the support to the pH of the suspension of the catalyst.

In other words, Mashkina and Sauer fail to suggest measuring the pH of a solution of the actual catalyst in an aqueous dispersion. As such, Mashkina and Sauer fail to recognize that the pH of a dispersion of the final product is a result-effective variable. However, as set forth at MPEP §2144.05 (II) B, only result-effective variables can be optimized. Specifically, a "particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said

variable might be characterized as routine experimentation.” *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977).

To the contrary, Maskina not only fails to recognize this result-effective parameter, but suggests, at page 159, first sentence, that “Catalysis obtained by impregnation of  $\text{Al}_2\text{O}_3$  with solutions of hepta-, dodeca-, meta- and normal alkaline metal tungstates showed approximately the same activities.” As set forth at page 162, lines 12-23, the pH of a solution determines the degree to which polycondensation to tungstates, for example, hepta- or dodeca-tungstates, occurs. Thus, a skilled artisan would not attempt to change the pH of the solutions used in preparing polytungstates because the catalysts of Mashkina possess approximately the same activity.

Likewise, Sauer suggests, at col. 2, line 65 to col. 3, line 3, that the pH of a combined solution of cesium tungstate and cesium hydroxide is adjusted to a range of 8 to 14 to stabilize the solution. Again, the pH of a suspension of a catalyst cannot be equated with the pH of an impregnation solution used in preparing this catalyst. Moreover, example 1 of Sauer forms the basis for comparative example 1 discussed at page 6, lines 9-15, of Applicants disclosure. The pH of a 10% aqueous suspension of comparative example 1 is outside the claimed range, as set forth in the Table at the top of page 7.

The Office Action further asserts, at page 5, second paragraph, that an “undiluted catalyst” has a different pH than a 10% aqueous suspension. The Office Action fails to provide support for this assertion. Moreover, it is not relevant whether or not the pH of an aqueous suspension of a catalyst at a strength different from 10% is different than a pH at a 10% strength. The metes and bounds of claim 1 can be assessed by measuring the pH of a 10% strength aqueous suspension of a catalyst. As set forth above, the catalyst suggested in Sauer is outside the scope of claim 1.

Applicants note that the applied citations in the Office Action were already relied on in the non-final Office Action of March 5, 2008. Applicants responded to that Office Action in the September 4, 2008 Response by providing an Experimental Report, highlighting the distinctions

over the applied citations, discussing the superior results of the claimed catalysts and stressing the criticality that a catalyst as claimed can operate closer to a 1:1 ratio of methanol and hydrogen sulfide, the starting materials in the production of methyl mercaptan. The final Office Action and the Advisory Action do not address any of Applicants' arguments. As such, the Office Action fails to meet the burden of answering all asserted advantages set forth in the September 4, 2008 Response. Specifically, as set forth in MPEP §707.07(f) "[i]f it is the examiner's considered opinion that the asserted advantages are not sufficient to overcome the rejection(s) of record, he or she should state the reasons for his or her position in the record." The Office Action did not meet this burden.

Moreover, the Office Action, at page 5, lines 1-5, relies on *In re Aller* for holding that modifying a process condition such as a concentration is not a patentable modification absent a showing of criticality. Yet the final Office Action and the Advisory Action fail to indicate whether Applicants' arguments regarding the criticality discussed above are considered persuasive.

Neither applied citation indicates what pH would be obtained with a 10% strength aqueous suspension of the catalysts suggested therein. Applicants previously resubmitted an Experimental Report, which measures the pH of a catalyst corresponding to the catalyst suggested in Sauer, on two very similar support materials, which corresponds to comparative example 1 discussed in Applicants' disclosure. As set forth in the Experimental Report, the comparative example results in 10% strength suspensions having a pH of 9.8 or 9.9, respectively, which is outside the range recited in claim 1.

Applicants demonstrated in the Experimental Report that an aqueous solution of the catalyst of comparative example 1 discussed on page 7 of Applicants' disclosure has a pH of 9.8 whereas aqueous solutions of the three catalysts as claimed have pH values in the range of 6.0 to 8.2. Further, the catalysts as claimed achieve surprisingly high selectivities and yields in the preparation of methyl mercaptan compared to comparative example 1.



In addition, a catalyst as recited in claim 1 achieves superior results over the catalysts suggested in Mashkina. Examples 6 and 7 of Mashkina, having a similar material composition to a catalyst as claimed, display a selectivity to methyl mercaptan of 83 and 86%, respectively. In contrast, the selectivities of the claimed catalysts, such as examples 2-4 in the table of page 7 of Applicants' disclosure, achieve superior selectivities of 88-89% at a significantly improved yield compared to the comparative example 1.

Further, as set forth on page 3, lines 1-2, of Applicants' disclosure, it is a critical feature of the claimed catalyst to perform well while the ratio of hydrogen sulfide to alcohol deviates only slightly from one to reduce the energy consumption required. The performance test described on page 7 demonstrates that the claimed catalyst achieves superior selectivities and yields at a molar ratio of hydrogen sulfide to methanol of 1.9 mol: 1.5 mol, i.e., a ratio of approximately 1.27, whereas Mashkina requires, in Table 1 on page 161, a ratio of 1.6.

The Office Action fails to provide motivation or a proper rationale for combining the applied citations in the manner suggested.

In conjunction with interpreting 35 U.S.C. §103(a) under *Graham v. John Deere*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966) and *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727 (2007), the initial burden is on the Examiner to provide some apparent reason or suggestion of the desirability of doing what Applicants did, i.e. the Examiner must establish a *prima facie* case of obviousness. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention, or the Examiner must present a convincing line of reasoning as to why a skilled artisan would have found the claimed invention to have been obvious in light of the teachings of the references.

The mere fact that cited art may be modified in the manner suggested in the Office Action does not make the modification obvious, unless the cited art suggests the desirability of the modification or impliedly suggests the claimed invention, or the Examiner has presented a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the applied citation. In particular, the assertion in

the Advisory Action that a skilled artisan would have a reasonable expectation of success in evaluating different dilutions to produce a catalyst system with pH values from 5-10 is merely a statement that the applied citations can be modified based on the roadmap provided by Applicants' disclosure. In fact, neither citation remotely suggests measuring the pH of a 10% strength aqueous suspension of the final catalyst, or of any other strength solution.

Similarly, at page 4, last paragraph, the Office Action asserts that a skilled artisan would have been motivated to practice the teachings of the cited references because it demonstrates that methyl mercaptan is useful in industrial applications. It is undisputed that methyl mercaptan is an important intermediate in many chemical reactions. Indeed, Applicants provide a catalyst that produces methyl mercaptan in higher yield, with higher selectivity, and under lower energy consumption. However, the assertion in the Office Action fails to address why or how a skilled artisan would modify Sauer and Mashkina.

Likewise, the assertion at page 5, lines 8-9, of the Office Action, that the combination [of Sauer and Mashkina] would have yielded predictable results, is irreconcilable with Applicants' disclosure, which describe the remarkably improved process conditions under which methyl mercaptan can be produced with a claimed catalyst.

No suggestion to combine the citations in the manner suggested appears in the cited art in this matter nor has a convincing line of reasoning been presented in this case. The Board's attention is kindly directed to *KSR Int'l Co. v. Teleflex, Inc.*, *supra*; *In re Dembiczak et al.* 50 USPQ2d. 1614 (Fed. Cir. 1999), *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984), *In re Laskowski*, 10 USPQ2d. 1397 (Fed. Cir. 1989) and *In re Fritch*, 23 USPQ2d. 1780 (Fed. Cir. 1992).

Claims 2-20 depend, directly or indirectly, from claim 1. Claims 2-20 are in condition for allowance for at least their respective dependence on an allowable claim 1, as well as for the separately patentable subject matter that each of these claims recites.

### VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on October 27, 2005.

Applicants concurrently herewith submit the requisite fee for the filing of an Appeal Brief. Applicants believe no additional fee is due with this response. However, if any such additional fee is due, please charge our Deposit Account No. 22-0185, under Order No. 12810-00159-US1 from which the undersigned is authorized to draw.

Dated: July 21, 2009

Respectfully submitted,

Electronic signature: /Georg M. Hasselmann/  
Georg M. Hasselmann  
Registration No.: 62,324  
CONNOLLY BOVE LODGE & HUTZ LLP  
1875 Eye Street, NW  
Suite 1100  
Washington, DC 20006  
(202) 331-7111  
(202) 293-6229 (Fax)  
Attorney for Applicant

**APPENDIX A - CLAIMS**

**Claims Involved in the Appeal of Application Serial No. 10/554,701**

1. A catalyst for the synthesis of methyl mercaptan, obtainable from aluminum oxide, an alkali metal tungstate and at least one further component selected from the groups of the ammonium salts and of the protic acids sulfuric acid, phosphoric acid, sulfurous acid, tungstic acid, phosphorous acid, hypophosphorous acid, or a mixture thereof, wherein the pH of the catalyst, measured on a 10% strength aqueous suspension, is in the range from 5.0 to 9.7.
2. The catalyst according to claim 1 which is obtainable from aluminum oxide, an alkali metal tungstate and at least one ammonium salt.
3. The catalyst according to claim 1, wherein the alkali metal tungstate used is a potassium tungstate.
4. The catalyst according to claim 1, wherein ammonium salts used are sulfates, phosphates, sulfides, tungstates, molybdates, sulfites, peroxodisulfates, phosphites and hypophosphites.
5. The catalyst according to claim 1, wherein ammonium salts used are sulfur- or phosphorus-comprising salts or tungstate salts.
6. The catalyst according to claim 1, wherein alkali metal tungstates are applied in an amount of from 10 to 16% by weight, based on the total mass of the catalyst.
7. The catalyst according to claim 1, wherein ammonium salts are applied in an amount of from 0.01 to 15% by weight, based on the total mass of the catalyst.
8. A process for preparing methyl mercaptans by reacting methanol with hydrogen

- sulfide, wherein a catalyst according to claim 1 is used.
9. The process according to claim 8, wherein hydrogen sulfide and methanol are used in a molar ratio of from 1 : 1 to 2 : 1 in the preparation of methyl mercaptans.
  10. The catalyst according to claim 2, wherein the alkali metal tungstate used is a potassium tungstate.
  11. The catalyst according to claim 2, wherein ammonium salts used are sulfates, phosphates, sulfides, tungstates, molybdates, sulfites, peroxodisulfates, phosphites and hypophosphites.
  12. The catalyst according to claim 2, wherein ammonium salts used are sulfur- or phosphorus-comprising salts or tungstate salts.
  13. The catalyst according to claim 2, wherein alkali metal tungstates are applied in an amount of from 10 to 16% by weight, based on the total mass of the catalyst.
  14. The catalyst according to claim 2, wherein ammonium salts are applied in an amount of from 0.01 to 15% by weight, based on the total mass of the catalyst.
  15. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 2 is used.
  16. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 3 is used.
  17. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 4 is used.

18. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 5 is used.
19. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 6 is used.
20. A process for preparing methyl mercaptans by reacting methanol with hydrogen sulfide, wherein a catalyst according to claim 7 is used

**APPENDIX B - EVIDENCE**

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

**APPENDIX C – RELATED PROCEEDINGS**

No related proceedings are referenced in II. above, hence copies of decisions in related proceedings are not provided.